REMARKS/ARGUMENTS

Favorable reconsideration of this application in light of the following discussion is respectfully requested.

Claims 1, 9, 27 and 29-43 are pending in the present application.

In the outstanding Office Action, Claims 1, 9, 27, 29, 30, 32, 33, 35 and 36 were rejected under 35 U.S.C. § 103(a) as unpatentable over Masuda et al. (herein "Masuda") and Hiura et al. (herein "Hiura"); Claims 31, 34 and 37 were rejected under 35 U.S.C. § 103(a) as unpatentable over Masuda in view of Hiura and U.S. Patent No. 6,157,747 to Szeliski et al. (herein "Szeliski"); Claims 39, 41 and 43 were rejected under 35 U.S.C. § 103(a) as unpatentable over Masuda in view of Hiura and Sato et al. (herein "Sato"); and Claims 38, 40 and 42 were indicated as allowable if rewritten in independent form.

Applicants gratefully acknowledge the indication of allowable subject matter.

Applicants respectfully traverse the rejection of Claims 1, 9, 27, 30, 32, 33, 35 and 36 under 35 U.S.C. § 103(a) as unpatentable over Masuda and Hiura.

In particular, Applicants respectfully traverse the assertions in the outstanding Office Action that Masuda discloses a range image having three-dimensional information representing a three-dimensional shape of the object, and generating a three-dimensional deformed image by three-dimensionally deforming the range image.[1] However, Masuda describes estimating a rotating matrix and a parameter of motion in parallel translation from two corresponded pairs of point sets to estimate motion of an object using a quaternion. Masuda indicates computing a parameter (parameter of equation (3)) for motion (rotation and parallel translation) by iterative computation, using data and a quaternion, i.e., equation (8). In other words, the deformed parameter is computed by comparing data derived from two range images.

[1] Office Action at page 3, lines 5-13.

In contrast, in the present invention, one of two range images is deformed using a known deformation parameter, and the deformed image is compared with the other of the range images. In other words, Masuda computes a motion parameter from the data, whereas the present invention generates a deformed image by giving values of parameters of the rotating matrix and parallel translation. Thus, the process of Masuda is opposite from the process of the present invention.

As described above, Masuda describes a real-time object tracking technique of performing generation of data from two range images, comparison of the data with each other and computation of deformation parameter, in order. In contrast, the present invention provides an image recognition method of generating range images, giving a deformation parameter to one of the range images, computing a deformed image and comparing a deformed image with the other of the range images. Accordingly, Applicants respectfully submit that Masuda does not teach or suggest "recognizing three-dimensional motion of the object in the range image by comparing the deformed image with a newly captured range image obtained by capturing the object currently," as recited in Claims 1, 9 and 27.

Further, Applicants respectfully submit that Masuda does not teach or suggest a deformed image. As described in sections 3.2, and 3.3, Masuda computes a corresponded pair of point sets. Further, Masuda describes sampling the image in point units and processing a group of points. Masuda does not indicate any deformation. However, even if the method of Masuda was to be considered as deformation, the method of Masuda merely deforms the group of points and generates no deformed image. Furthermore, although Masuda computes correspondence between point sets, the present invention does not rely on a correspondence point, and does not require computing corresponding points. Therefore, Applicants respectfully submit that Masuda also does not teach or suggest "generating a

three-dimensional deformed image by three-dimensionally deforming the range image," as recited in Claims 1, 9 and 27.

Hiura describes a method of computing a motion parameter from a plurality of range images like Masuda, and therefore, for reasons similar to those described above, Hiura is also different than the claimed invention. Hiura describes simply a vague concept of computing a motion from the range images in real time, and does not relate directly to the claimed invention.

Accordingly, Applicants respectfully submit that independent Claims 1, 9 and 27, and claims depending therefrom, are allowable.

Further, Applicants respectfully traverse the rejection of Claims 31, 34 and 37 under 35 U.S.C. § 103(a) as unpatentable over Masuda in view of Hiura and Szeliski.

In particular, Applicants respectfully traverse the assertion in the outstanding Office Action that Szeliski teaches scaling a 3D image based on the rotational motion.[2] However, Szeliski does not describe the claimed image recognition method of generating range images, giving a deformation parameter to one of the range images, computing a deformed image and comparing a deformed image with the other of the range images. Further, Claims 31, 34 and 37 depend from Claims 1, 9 and 27 respectively, which as discussed above are believed to be allowable. Accordingly, it is respectfully requested that rejection be withdrawn.

In addition, Applicants respectfully traverse the rejection of Claims 39, 41, and 43 under 35 U.S.C. § 103(a) as unpatentable over Masuda in view of Hiura and Sato.

In particular Applicants respectfully traverse the assertion in the outstanding Office Action that Sato teaches obtaining 3D images based on the reflectance of light from the object.[3] However, Sato describes a technique of generating a 3D shape from a plurality of range images and processing a color image to be pasted to the 3D shape model using a

[2] Office Action at page 5, lines 11-13.
[3] Office Action at page 6, lines 14-17.

reflectance model to generate a color image without producing an unpleasant sensation in the viewer. Sato describes in section 2.2 that "[i]n this section, a method for generating a three-dimensional object shape from multiple range images is described." In other words, Sato describes generating a three-dimensional object from multiple range images. Further, Sato describes in section 2.2 that "[t]he recovered object shape and the sequence of input color images are used for estimating reflection model parameters at each triangular patch. The algorithm to estimate reflectance parameters of the object surface from the sequence of color images will be explained in the section." In other words, Sato estimates reflection model parameters using the three-dimensional image and color image.

As described above, Sato does not use reflection for the purpose of generating the three-dimensional model. The three-dimensional model of Sato is generated only by the range images obtained by a plurality of range finders. In other words, Sato does not teach generating range images based on the reflectance of light from the object.

The word "reflection" described by Sato does not mean "reflected light" but "reflection property", "reflection component" and "reflection parameter" of an object. In other words, the "reflection" of Sato is not directed to an "amount of reflection" but to a "reflection quality" of the object surface.[4]

Further, Applicants traverse the assertion in the outstanding Office Action that the reflectance of light is described in the Abstract and at Sections 2 and 3 of Sato.[5] However, Sato describes the term "specula spike" at page 495, third paragraph, the second line, but does not relate this technique to the reflectance of light. Further, the word "reflection" described in Sato is used for "reflection property" existing in a color image obtained by capturing the surface of an object, but does not relate to a "range image," as recited in Claims 39, 41 and 43.

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[4] Sato at sections 2.2 and 3.
[5] Office Action at page 6, lines 15-17.

Accordingly, Applicants respectfully submit that none of Masuda, Hiura or Sato teach or suggest the features of Claims 39, 41 and 43. Further, Claims 39, 41 and 43 depend from Claims 1, 9 and 27 respectively which are believed to be allowable as discussed above. Accordingly, it is respectfully requested that rejection be withdrawn.

Consequently, in light of the above discussion, the present application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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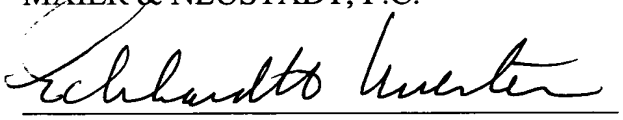

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